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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/590,081	08/21/2006	Mitsuru Yamamoto	Q96217	4161

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EXAMINER	
ROSENAU, DEREK JOHN	

ART UNIT	PAPER NUMBER
2834	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/590,081	YAMAMOTO ET AL.	
	Examiner	Art Unit	
	Derek J. Rosenau	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Senda et al. (US 2002/0008439) in view of Honda et al. ("Class D Audio Amplifier Design"), Ishii et al. (US 2006/0132231), Nakano et al. (US 2002/0033322), and Katsumi et al. (JP 2001-355574).

3. With respect to claim 14, Senda et al. discloses a piezoelectric pump drive circuit comprising: an oscillation means (Fig 1, items 104 and 105) for generating a sine wave signal of the frequency that drives a piezoelectric element (Paragraph 41); an amplification means (item 106) for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave (Fig 1); a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means (Paragraphs 52-54); and a temperature sensing means for sensing temperature (item 112).

Senda et al. does not disclose expressly that the oscillation means is a sine wave oscillation means or a cooling system comprising: a voltage-boosting means for converting a low-voltage power supply to a high voltage; an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means for driving said piezoelectric

element by a high-voltage sine wave; a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means; wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width nodulation to realize amplification; a low pass filter for demodulating the output signal of said D-class amplifier; a heat sink that contacts a heat-generating body; a radiator for radiating heat to the outside; coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; or a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulating passages.

Honda et al. teaches an amplification means driven by a voltage supply for amplifying a signal supplied as output from a sine wave oscillation means and for driving an output by a high-voltage sine wave (page 5); wherein said amplification means is composed of: a D-class amplifier (pages 4-7) driven by a voltage generated from a voltage supply for subjecting the signal supplied as output from the sine wave oscillation means to pulse-width modulation to realize amplification (page 5); and a low-pass filter fro demodulating the output signal of said D-class amplifier (page 5).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the D-class amplifier of Honda et al. with the piezoelectric drive circuit of Senda et al. for the benefit of improved efficiency (page 2 of Honda et al.).

Ishii et al. teaches an amplification means including a D-class amplifier driven by a high voltage generated from a voltage-boosting means for converting a low-voltage power supply to a high voltage (Paragraph 36) and that the oscillation means is a sine wave oscillation means (Paragraph 137).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the voltage-boosting means of Ishii et al. with the piezoelectric drive circuit of Senda et al. for the benefit of being able to use a lower-voltage power supply for the amplification means.

Nakano et al. teaches a piezoelectric drive circuit that includes a temperature sensing means for sensing temperature and a second control means for adjusting the signal amplitude of a sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means (Paragraph 17).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the control means of Nakano et al. with the piezoelectric drive circuit of Senda et al. for the benefit of providing additional compensation due to fluctuations in temperature (Paragraph 17 of Nakano et al.).

Katsumi et al. teaches a cooling system (Abstract) comprising: a piezoelectric pump drive circuit (Abstract) comprising: a heat sink (Abstract, item 3) that contacts a heat-generating body (Abstract, item 4); a radiator for radiating heat to the outside Abstract, item 5); coolant circulation passages connected such that coolant circulates between said heat sink and said radiator (Abstract); and a piezoelectric pump that is

driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages (Abstract).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the cooling system of Katsumi et al. with the piezoelectric drive circuit of Senda et al. for the benefit of incorporating the temperature-compensated drive circuit of Senda et al. into the cooling system of Katsumi et al.

4. With respect to claims 11-13, the subject matter therein are rearrangements of the subject matter in claims 14; therefore, claims 11-13 are unpatentable over Senda et al. in view of Honda et al., Ishii et al., Nakano et al., and Katsumi et al. for the same reasons as above.

5. With respect to claims 11 and 12, the claims further limits the control means to include a control means for one of increasing or decreasing the signal amplitude of said sine eave oscillation means in accordance with corresponding increased or decreased sensed temperature of said heat-generating body. This feature can be seen in paragraph 17 of Nakano in which the control means increases or decreases the signal amplitude of said sine wave oscillation means in accordance with corresponding increased or decreased temperature of said heat-generating body.

6. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Senda et al. in view of Honda et al. and Ishii et al.

7. With respect to claims 1-3, the subject matter therein are rearrangements of the subject matter in claim 14; therefore, claims 1-3 are unpatentable over Senda et al. in view of Honda et al. and Ishii et al. for the same reasons as above.

8. Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Senda et al. in view of Honda et al., Ishii et al., and Nakano et al.

9. With respect to claims 4-7, the subject matter therein are rearrangements of the subject matter in claims 14 and 12; therefore, claims 4-7 are unpatentable over Senda et al. in view of Honda et al., Ishii et al. and Nakano et al. for the same reasons as above.

10. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Senda et al. in view of Honda et al., Ishii et al., and Katsumi et al.

11. With respect to claims 8-10, the subject matter therein are rearrangements of the subject matter in claims 14 and 12; therefore, claims 8-10 are unpatentable over Senda et al. in view of Honda et al., Ishii et al., and Katsumi et al. for the same reasons as above.

Response to Arguments

12. Applicant's arguments filed 12 June 2008 have been fully considered but they are not persuasive.

13. Applicant argues that Senda does not disclose a sine wave oscillation means. While this is true, Ishii does disclose that the oscillation means is a sine wave oscillation means. As it is well known in the art to use sine wave oscillation means to drive piezoelectric motors, it would have been obvious to substitute the square wave oscillation means of Senda with the sine wave oscillation means of Ishii.

14. Applicant argues that Senda does not describe an amplification means driven by high voltage or driving the motor with high voltage. However, as the claims do not

specify what is meant by a "high" voltage, the voltages used for driving the amplification means of Senda and the motor of Senda can be interpreted as being high voltages.

15. Applicant argues that Ishii does not disclose a voltage-boosting means for converting a low-voltage power supply to a high voltage. Again, as applicant does not specify what is meant by "low" or "high" voltage, the amplification means of Ishii can be interpreted as converting a low-voltage power supply to a high voltage.

16. Applicant argues that the applied references do not disclose control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means. However, the device of Senda adjusts the frequency continuously over a range of temperatures. As the ranges of frequencies and temperatures are continuous, they would include three or more values. The device of Senda performs this temperature control at all times, and therefore would perform the temperature control at the time of activation of said sine wave oscillation means.

17. Applicant argues that Nakano does not disclose a control means for one of increasing or decreasing the signal amplitude of said sine wave oscillation means in accordance with corresponding increased or decreased sensed temperature of said heat-generating body. However, this language does not require that the increase in amplitude corresponds to an increase in temperature; it merely requires that the amplitude is either increased or decreased when the temperature either increases or decreases.

18. Applicant argues that none of the applied references discloses both a first control means for implementing variable frequency control and a second control means for adjusting the voltage amplitude based on the sensed temperature. However, the combination of references discloses both the first and second control means, as Senda discloses a first control means for implementing variable frequency control and Nakano discloses a second control means for adjusting the voltage amplitude based on the sensed temperature.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek J. Rosenau whose telephone number is (571)272-8932. The examiner can normally be reached on Monday thru Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren Schuberg can be reached on 571-272-2044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Derek J Rosenau
Examiner
Art Unit 2834

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Examiner, Art Unit 2834

/J. A. San Martin/
Primary Examiner, Art Unit 2834